

composing it; for the magnetic needle is deflected in an equal degree by every part. He succeeded in exhibiting the rotation of a piece of charcoal, and of a column of water, while transmitting voltaic electricity, round the pole of a magnet. Having noticed a difference of temperature in the fluid conductor in the vicinity of the two poles, he was led to investigate the cause of this phenomenon. A rectangular box being divided into three compartments by two partitions of bladder, and filled with water, and the wires from the two poles of the battery being inserted into the extreme compartment, the temperature of the water surrounding the positive pole was found to be higher than that surrounding the negative pole, and that in the middle compartment highest of all. These differences he ascribes to the cooling effects of the disengagements of the several gases at each respective pole, the volume of the hydrogen being double that of the oxygen, producing twice the effect. With metallic solutions, the reverse takes place, the effect depending in every case upon the relative specific heat of the substances disengaged at the two poles.

The reading of a paper, entitled, "On the Organs of the Human Voice," by Sir Charles Bell, Knt. K.H., F.R.S., was commenced.

February 9, 1832.

HIS ROYAL HIGHNESS THE DUKE OF SUSSEX, K.G.,
President, in the Chair.

A paper was read, entitled, "Some Remarks on an Error respecting the Site and Origin of Graham's Island." By Capt. W. H. Smyth, R.N. K.F.M. F.R.S.

The author rectifies an erroneous assertion, originating from the report of Captain Larmour, who in the year 1800, when commanding the *Wassanaer*, a troop-ship on the Egyptian expedition, thought he observed a shoal of four fathoms water with breakers, within a mile of the latitude and longitude of the new volcanic island. The author has determined, by his own observations, that no such reef exists in that spot, nor is the assigned place of this shoal near that of Graham's Island, which arose considerably to the eastward, from a depth of above a hundred fathoms below the surface of the water. A knoll, with only seven fathoms of water upon it, was discovered not far from the site of these reports. The Adventure bank extends from Sicily nearly to Pentellaria, where the water deepens at once from 76 fathoms to above 375 fathoms, at which no bottom was met with. But, even on the supposition that what Capt. Larmour imagined he saw was the result of a temporary subaqueous volcanic eruption, it could not have justified the assertion of there being breakers with four fathoms upon them; and still less does it afford any foundation for the hypothesis that Graham's Island was formed by the mere lifting up of such shoal.

A paper was also read, entitled, "Researches in Physical Astronomy." By J. W. Lubbock, Esq., M.A. V.P. and Treasurer R.S.

For the solution of mechanical problems, two methods in general present themselves; the one furnished by the variation of parameters, or constants, which complete the integral obtained by the first approximation,—the other furnished by the integration of the differential equations by means of indeterminate coefficients, or some equivalent method. Each of these methods is applicable to the theory of the perturbations of the heavenly bodies, and they lead to expressions which are of course substantially identical, but which do not appear in the same shape except after certain transformations.

The object of the author in the present paper is to effect transformations, by which their identity is established, making use of the developments given in his former papers, published in the *Philosophical Transactions*. The identity of the results obtained by either methods affords a confirmation of the exactness of those expressions.

Sir Charles Bell's paper "On the Organs of the Human Voice" was then read in continuation.

February 16, 1832.

HIS ROYAL HIGHNESS THE DUKE OF SUSSEX, K.G.,
President, in the Chair.

The reading of Sir Charles Bell's paper "On the Organs of the Human Voice," was resumed and concluded.

The author complains that the actions of the organs of the voice have been negligently treated by physiologists, and that many of the offices of the structures subservient to that function have been overlooked; and expects that the study of them will lay a foundation for prosecuting the intricate anatomy of the nerves of the neck, which he proposes to himself as an ulterior object. The subjects to which he particularly directs his attention in the present paper, are the Muscularity of the Trachea, the Position of the Thyroid Gland, and the Action of the Pharynx, which he alleges to have been entirely omitted in previous systematic accounts of articulate language.

The trachea is strengthened by imperfect circles of cartilage, the ends of which are united at the back part of the tube by a transverse layer of muscular fibres,—a structure which is very distinctly seen in the horse. This transverse muscle is an antagonist to the elasticity of the cartilages, and the effect of its action during expiration is, by contracting the diameter of the tube, to favour the propulsion of the mucous secretion, which may have been accumulated in the passage, and to contribute effectually to expel it by the effort of coughing. The same action leads also to the expulsion of foreign bodies which may have accidentally got into the trachea. In birds, where the inner surface of the passage is without moisture, no such provision was required; and accordingly we find the cartilages of the trachea are complete circles, not admitting of contraction.